

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, December – 2024

MATHEMATICS – IV

(COMMON TO EEE & ECE)

Time: 3 Hours**Max. Marks: 75****Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

		Course Outcome	B.T Level	Marks
1.	Write Fourier cosine integral formulae.	CO1	L1	2M
2.	Find the Fourier sine transform of $f(x) = x$.	CO1	L1	3M
3.	Define Analytic function.	CO2	L1	2M
4.	Find k such that $f(x,y) = x^3 + 3kxy^2$ is harmonic	CO2	L1	3M
5.	State generalized Cauchy theorem.	CO3	L1	2M
6.	Evaluate $\int_0^{1+i} (y - x - 3x^2i) dz$ along the path $y = x^2$.	CO3	L1	3M
7.	State Residue theorem.	CO4	L1	2M
8.	Evaluate $\int_C \frac{\log z}{(z-1)^2} dz$ where $C; z-1 = 1/2$.	CO4	L1	3M
9.	Define bilinear transformation	CO5	L1	2M
10.	Find the fixed points of the mapping $w = (5z+4)/(3z-7)$	CO5	L1	3M

Section B (Essay Questions)**Answer all questions, each question carries equal marks.****(5 X 10M = 50M)**

11. A) Find the Fourier transform of $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$. Hence evaluate the values of i) $\int_{-\infty}^{\infty} \frac{\sin \lambda a \cos \lambda x}{\lambda} d\lambda$, ii) $\int_0^{\infty} \frac{\sin \lambda}{\lambda} d\lambda$.

OR

- B) Find the Fourier cosine transform of $e^{-ax}, a > 0$ and hence deduce the inversion formula.
12. A) Show that the function $f(z)$ defined by $f(z) = \frac{xy^2(x+iy)}{x^2+y^4} (z \neq 0)$, $f(0) = 0$ is not analytic at $z = 0$ although the Cauchy's- Riemann equations are satisfied at the origin.

OR

- B) Let $f(z) = u + iv$ be an analytic function such that $v = x^2 - y^2 + \frac{x}{x^2 + y^2}$. Construct the function $f(z)$ in terms of z and hence find its real part u .

13. A) Using Cauchy's integral formula, evaluate $\oint_C \frac{e^{2z}}{(z-1)(z-2)} dz$, where
C is $|z|=3$ CO3 L3 10M
- OR**
- B) Find the Laurent's series expansion of the function $\frac{z^2 - 6z - 1}{(z-1)(z-3)(z+2)}$ in the region $3 < |z+2| < 5$ CO3 L2 10M
14. A) Evaluate $\int_C \frac{2e^z}{z(z-3)^3} dz$ with c: $|z|=2$ using Cauchy Residue theorem. CO4 L3 10M
- OR**
- B) Show that $\int_0^{2\pi} \frac{d\theta}{a + b \sin \theta} = \frac{2\pi}{\sqrt{a^2 - b^2}}$ ($a > b > 0$) CO4 L2 10M
15. A) Show that $w = \frac{2z+3}{z-4}$ maps the circle $x^2 + y^2 - 4x = 0$ onto a straight line $4u+3=0$ CO5 L3 10M
- OR**
- B) Find the Bilinear Transformation which maps the points $(2, i, -2)$ into the points $(1, i, -1)$. CO5 L2 10M